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BOOK REVIEWS

Group Theoretical Methods in Physics (Lecture Notes in Physcs, Vol 313)

(Proceedings of the XVI International Colloquium held at Varna, Bulgaria, June 15–20, 1987)

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This book embodies the proceedings of the 16th International Colloquium on group theory held at Varna, Bulgeria in June, 1987. For a subject like group theory where new and remarkable theorems of interest in physics are still coming up in the literature, it might appear that the book may have already lost its topicality somewhat. Even a quick first reading, however, dispels this fear : the coverage on representation theory, the Lie superalgebras, supersymmetries, group theory in manybody systems, gauge theory, field theory and strings has lost none of their relevance. There are quite a few clear but tersely written articles which a professional practitioner in the field could read with considerable profit. At the risk of a somewhat biased reviewing of the articles in book, I may mention in particular a few :

(I) Representation theory : There is a new twist given in the paper by Gindikin on twistor algebra. Judd presents a clear group theoretic treatment leading to expressions of 6–j and 9–j symbols for a class of the groups of use in Molecular Physics (Jahn–Teller effect, for example). Post discusses equations for τ-functions and representation of Kac–Moody groups.

(II) Lie superalgebra and supersymmetry : Superalgebras and sypersymmetric Quantum Mechanics are treated by Beckers and Hussin and by Boya. The latter in particular discusses many physical examples using such generic potentials δ-functions, Pöschel–Teller and intermediate range types where the scattering amplitudes behave in nongeneric way. Montovsi *et al* give a very readable account of the role of supersymmetry in the self consistent solution of the states of a many-fermion system. Ueno and Yamada give a thorough discussion of the solution solutions for the super Kadomtsev–Petviashvili hierarchy.

(III) Symmetries and Quantization Methods : A Bohm *et al* give a detailed account of relativistic spectrum generating groups related to collective model for hardons. Bracken and McAnally discuss the classic So(4,2) group for the coulomb problem using a tilted form admitting of an explicit solution of the Heisenberg's equation. Tsanov and Mladenov delineate the geometric quantization of the Kepler problem with a magnetic monopole.

(IV) Many Body System etc : Jaric gives an unusual overview of group theory of quasicrystals. Kasperkovtz discusses ergodic properties of hard rod systems. Kotzev and

Alexadrova classify all color space groups of cubic chromomorphic classes. Ozaki gives a good survey of the group theoretical analysis of the lattice distortion in anisotropic superconductivity.

(V) Nuclear Physics : Feng gives a summary of the recent schemes of symmetry classification in nuclear levels. Georgieva *et al* present the boson representation of the Sp(24,R) and the related classification of even–even nuclei. Moshinsky, true to his fame, gives a fascinating presentation of the nuclear collective WSp(6,R) model.

(VI) Gauge Theories : O'Raifeartaigh describes an Euclidean extension of the anomaly flux-flux identity. Paseman presents QED as a theory of quantised connection forms. Spiridonov discusses Sp(2)–symmetric realization of the ghost spectrum in the gauge theories.

(VII) Field and String Theories : Floreanini and Vinet discuss complex scalar fields in So(2,1)–invariant backgrounds. Guzean and Hans deal with conformally invariant wave equations on 3+2 de Sitter space. Piette discusses properties of some solutions of the U(N) sigma models Reugg presents a new outlook on the classic problems of the fermions and Jordan matrices. Smit discusses the use of algebraic and arithmetic geometry in string theory.

It would be clear from the above selected examples that the volume covers a diverse range of topics—all on frontier areas (including the ever new'classic' ones)—and it would continue to be a good source–book of contemporary group theory research in Physics for quite some time to come.

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Differential Equations (Lecture Notes in Pure and Applied Mathematics, Vol 118)
(Proceedings of the EQUADIFF Conference, 1987)
edited by C M Dafermos, G Ladas and G Papanicolaou
Marcel Dekker New York Basel, 1989
xi+787 pages, illustrated , price $ 150.00 (Soft cover) , ISBN 0-8247-8077-9

This book covers the proceedings of the 1987 EQADIFF Conference held at the Democritus University of Greece. A whole series of such conferences being held for more than a decade emphasizes the spirit of the modern paradigm that has emerged, viz. the unification of the field embodying diverse aspects such as 'ordinary', 'partial' or 'functional' differential equations. This present volume is a very good addition to the mathematics literature which bolsters the above paradigm.

The breadth of the topics covered is too much to be surveyed comprehensively in a

brief review. The volume runs to almost 800 pages. The papers also vary greatly as regards lucidity and detailed exposition. Some are very brief reports, while some are written in predagogically useful style.

Alexander and Feidler discuss in detail the global decoupling of coupled symmetric oscillators, using graph theoretic tools. Arnold and Boxler give a good survey of the modification of the deterministic bifurcation in the presence of a noise and attempt to answer the questions related to the nature of a truly stochastic bifurcation. Barbanti studies controllability (and approximate controllability) for linear integral equations of the Volera–Stieltjes type. Bestman covers some aspects of thermal stability of a chemically reacting gas in a powers sphere. Chaljub–Simons discusses the existance of positive exponentially decreasing solutions for a class of non-linear differential equations with an unbounded coefficient. There is an extended discussion on Orthogonal Polynomials in symmetrical domains of R^m by Cnops. Da Prato gives an expose on fully non-linear equation in Banach space. There is a short but lucid survey on non-standard analysis applied to ordinary differential equations. A similar short account is given by Englefield on explicit solutions of Fokker-Planck equation. Furumochi discusses uniform asymptotic stability in functional differential equations. Gripenberg reports results on optimal control and integral equations. Hino covers periodic solutions of a linear Voltarra system while Hirano discusses multiply periodic solutions for semi-linear wave equations with forcing terms. Jodar gives a very readable survey of a class of explicit solutions for Riccati operator differential equations. Kloeden and Lorenz give a survey of Lyapunov stability and attractors under discretization of differential equations, which is of great practical interest in numerical treatments. Kravvaritis and Stavvakakis treat an existence theorem for nonlinear random differential inclusions. Similar existence theorems are studied by Ladas *et al* for second order differential equations with piecewise consistant arguments. Lange has studied the asymptotic behaviour of solutions to quasi-linear Schrödinger equations. Vibrations of a 'fractal drum' are discussed in Lapidus and Fleckinger. Mattheij covers some aspects of boundary value problems for ordinary differential equations with parameters. Murakami and Niato discuss some properties of phase space for functional differential equations with infinite delay. Casasayas and Nunes give a detailed analysis of the solutions of hamiltonian systems with (r,θ) dependent potentials for $n\varepsilon(2,+\alpha)$ and $n\varepsilon(0,7)$ cases. Palamides and Erbe discuss semi-periodic boundary value problems. Pascali covers nonlinear variational eigenvalue inclusions. Peeters reports results on minimal realizations of integral operators with semi-seperable kernels. There is a detailed discussion on elliptic equations with nearly critical growth by Peletier. Popovanov discusses aspects of nonlocal regularization of some overdetermined boundary value problems. A finite difference method for solving the stream function equation and computing nonsteady viscous fluid flows is investigated by Rakidzi and Radev. Rigas gives a brief survey of the efforts to identify a nonlinear stochastic and integral equation via spectral methods. Geometrical structure of attractors of a slow-fast dynamical system, viz. double scroll chaotic attractor, is analyzed by Rossetto. Salvi reports on exterior nonstationary

problem for the Navier–Stokes equation for regions with moving boundaries. Turo discusses generalized solutions of mixed problems for quasi-linear hyperbolic systems of functional partial differential equations. Ugowski discusses the first Fuorier problem for some integro-differential equations of parabolic type of use in thermoelasticity. Valerncia discusses invariant regions for hyperbolic version of Fitz Hugh-Nagumo equation used in modeling nerve-conduction. Valli discusses an existence theorem for non-homogeneous inviscid incompressible fluids. Vanderbauwhede *et al* treat secondary bifurcation in symmetric systems. Varga considers a continous model of the evolution of a population under the effect of selection. Venkides discusses the small dispersion limit of the Korteweg de Vries equation. Wedig considers stability of nonlinear stochastic systems.

The above gives only a bird's eye view of the range of topics covered. The book would have been somewhat more readable had the editors grouped them into suitable categories. There is however an extensive subject-index at the end which should help the reader to find his/her own topics of interest. The book is a welcome compendium addition to our repertoire on Differential Equations.

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